all his previous ones, and gave evidence of a time approaching when the shapes of nebulae, and the relative brightness of the different parts, will be recorded photographically in a better manner than by the most careful hand-drawings. The behavior of the very faint stars in the nebula also led to results of the greatest interest. These stars appear on his negatives taken with exposures of from thirty-seven to sixty minutes; and, as the time of exposure can be easily extended to hours, Mr. Common thinks it quite possible to get stars invisible to the eye in the same telescope used for photography. Mr. Common has already experimented with the longer exposures, and more details are brought out with every increase of the time; and it appears that the extreme limit of useful exposure has not even been reached at an hour and thirty minutes.

Mr. Common has also obtained beautiful photographs of other nebulae and of the planets Jupiter and Saturn, and has also applied himself successfully to obtaining photographic star-maps to stars of the eleventh magnitude.

In connection with all this variety of valuable astronomical work, it should be noted that Mr. Common belongs properly to the ranks of amateur astronomers; and this fact was dwelt upon at some length by Mr. Stone, at the conclusion of his address, as follows: —

"The lesson taught is not a new one. The records of our society are rich in the labors of our amateur astronomers. The amateur who can provide himself with sufficient instrumental means for original research need fear no professional rivalry. Untrammelled by the necessity of continuing observations whose value largely depends on their continuity, having the power of taking up any subject he pleases, without fear or responsibility of charges of wasted time and wasted means, he possesses advantages which are priceless in the tentative and experimental stages of any work.

"It is in work of this class that the most striking advantages in our science must be expected ; and such work will most certainly repay, by the gratification of personal success, the efforts of those who devote themselves to original work in our science; and the field of research presented is absolutely boundless."

INSECTS AND FERMENTATION.

THANKS to a long line of investigators and experimenters, beginning with Sprengel, and including among its recent leaders Darwin and Hermann Müller, we know that very intricate relations exist between flowering plants and insects which result to the advantage of both; many insects obtaining their food exclusively, or in large part, from the nectar and pollen of flowers, which are strengthened by intercrossing as a result of their visits. Within the last few years the activity of insects has also been shown to have a close connection with the distribution of other and lower organisms. The fetid slime of phalloids has long been known to be attractive to many flies and scavenger-beetles; and, as Mr. Gerard suggests in the case of the common stinkhorn (Phallus impudicus), the dissemination of these fungi is largely traceable to such insects. Rathay has likewise shown that a partnership of a somewhat similar nature probably exists between some of the rust fungi (Roestelia, Aecidium), and insects which feed upon the sweet secretion that accompanies their spermatia. In these cases the arrangement appears to be mutually beneficial. In the last it may also favor the spread of diseases of the higher plants, and so lead to important indirect results. Zymotic diseases of man and the domesticated animals are also known to be carried by the same active agents, which, however, appear to be rather accidental than specially provided for; while, in the asserted intervention of mosquitoes in the parasitism of Filaria, they are decidedly losers by their part in the transaction.

Boutroux has recently shown[1] that insects also play a very important, if indirect, *rôle* in the life-history of yeasts. It has been generally asserted that the agents of spontaneous fruit-fermentations, like those employed in the manufacture of wine and cider, are found on the surface of the ripe fruit, whence they readily reach the expressed juice. Boutroux was led to investigate their occurrence not only on ripe fruits, but on those which were immature, as well as in the saccharine secretions of flowers and on the bodies of the insects which visit both classes of objects. He prepared tubes of sterilized cherry-juice, or other fermentable liquid, from which germs were excluded by means of cotton. After these had shown their freedom from yeast by remaining unchanged for a fortnight, at a temperature favorable for fermentation, a fruit, flower, or insect was introduced into each, precautions being taken to prevent the introduction of germs from other sources. Repeated transfers were made from these first propagation cultures, where several species were usually found, until these were isolated, when their form and physiological characters were studied.

Contrary to the prevalent opinion, it was found that ripe fruits, as long as they are intact, bear comparatively few yeast-germs, these being much more frequent on green fruit, as well as in the nectar of flowers and on the bodies of the insects which are common about flowers. From what appears to have been a careful series of experiments, Boutroux advances the opinion that these spontaneous yeasts are regular inhabitants of nectar, being carried from flower to flower by insects in their visits for this beverage. After the fading of the flower, especially where some of its organs persist on the ripening fruit, they remain, the number of germs suffering constant diminution from rain and other causes. When the fruit has ripened, a few of these germs may still be present; while others are brought from later flowers, or from injured and fermenting fruit, by insects which feed upon the juices of the latter. The hibernation of these species is thought to occur on the remains of fallen fruit, as well as in the ground, whence a new supply is obtained the next spring. It is interesting to note that the species which have been obtained in these cultures are not identical with the wine and cider ferments, although some of them resemble these closely; and it is suggested, that, while

[1] *Ann. des sci. naturelles, Bot.*, 6 sér., v., xvii., p. 144.

these species are undoubtedly derived from the surface of the ripe fruit, their germs are extremely rare, though capable of rapid multiplication when once introduced into the must. W. TRELEASE.

THE VARIATION OF TEMPERATURE IN GERMANY.[1]

DR. HELLMANN has, by this paper, added another to the already large list of climatological contributions which have appeared in the German language. Such papers can and ought to serve as models for the uses to which the data secured in our own country should be put; and although we may have no particular interest in the climatical relations which exist in a certain part of Europe, yet each paper of the nature of the present should be carefully examined as to method, if not for results.

In 1874 there was given in this same publication an article on the climatology of Germany; and this contained the mean temperature for the twenty-five years from 1848 to 1872 of the stations connected with the Prussian meteorological institute. Hellmann has made a new discussion of these temperatures, and has included in this the ten years extending from 1872 to 1882. He has chosen to put the observations into five-day periods; and, using these means in his discussion, he proceeds, by means of combining certain stations, to show what deductions he can draw from the material at his disposal. The twenty-five stations he divides into seven districts, which have recognizably different meteorological conditions; and these stations are quite evenly distributed. Of the twenty-five, only ten were complete in their meteorological data; but the lacking observations have been filled in, and the error of this reduction will not exceed 0.2° C. Hellmann then proceeds to give the missing dates for the various stations. The observations were made at six, two, and ten, with one exception; and he deplores the fact that the lack of good hourly observations does not allow the reduction of these to a true daily mean. The temperatures for the various places are plotted, and curves drawn, on the same page, so that they can be easily compared with each other; and the curves are, in general, similar. The author brings out the fact that "unperiodic weather characteristics are not of a local nature, but occur at the same time over large areas." He also shows that the yearly extremes increase as we proceed inland. With three exceptions, the coldest weather occurred in the five days between Jan. 11 and Jan. 15, but the warmest weather does not occur in all at the same time: this varies from July 17 to July 27. Hellmann goes into a detailed discussion of this difference and the reason. He remarks that Wargentin, in 1760, was the first to use the mean temperature for five-day periods in showing the yearly rate. The temperature-curves of Breslau for ninety-two years and for thirty-five years are compared. An interesting table is given in which the probability is computed that each succeeding five days will be colder from January to August, and warmer from August to January. The periodic return of colder weather is carefully examined and commented on in detail.

At the end of five pages of text we find six pages of tables, containing the five-day means for each of the stations from 1848 to 1882; then comes the graphical representation of this as already mentioned, and next a number of curves showing the relations of the air-pressure, temperature, rain, and probability of succeeding cold at Breslau from 1848 to 1882, and then curves showing the temperature for May and June for Breslau for each year of this same period.

F. W.

[1] *Ueber den jährlichen gang der temperatur in Norddeutschland.* By Dr. G. HELLMANN. From the *Zeitschrift der Königlich preussischen statistischen bureau's, jahrgang* 1883.

LOUIS PASTEUR.

M. Pasteur. Histoire d'un savant, par un ignorant. Paris, *Hetzel*, 1883. 14+392 p. 16°.

IT is the fashion at present to tell the unfinished histories of living men. Noteworthy literary characters have been of late studied, weighed, almost vivisected; and now science pauses to listen to the life-history of one of her living masters. Let us be thankful, however, that we are not yet asked to take the measure of our friend before his death. On the contrary, we are only invited to draw our chairs about the fireside, while a mutual friend discourses to us, half aloud, and half in confidence, about the man and the scholar, Louis Pasteur.

The book whose title stands above has caused much comment on the continent and in England; so much, indeed, that an English translation is already announced, for which, rumor has it, we are indebted to Professor Tyndall, always a warm admirer of Pasteur. Some of the Parisian correspondents of journals published elsewhere have apparently been much impressed by the book, and have written elaborate reviews of it.

The author of this little history modestly professes to be '*un ignorant*,' whose only merit is that he appreciates the master. On laying down the book, we cannot believe that he really deserves his chosen title, for he has certainly mastered the master himself. However, we shall not quarrel with him, especially since he is now known to be the son-in-law of Pasteur, but shall rather thank him for the labor of love and enthusiasm which he has done so well. As has been hinted above, the author has given a familiar account of the life and labors of Pasteur. The book is not a 'critical examination:' it is, rather, a fascinating story. Of course, from the rigid scientific stand-point, it is one-sided and partial. Objectors and ob-